Satellite and Aerial Imagery
Demonstration Project

Glossary of Remote Sensing and GIS Terms

Bonneville
Power Administration

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Adapted from terms and definitions developed and published by the USGS, NASA and other sources.

ABLATION

Removal of a part by melting or vaporization.

ADAPS--AVHRR Data Acquisition and Processing System

The EROS Data Center ADAPS, which began operation in May 1987, receives approximately 6 passes per day of **HRPT** data over the conterminous United States.

AEROMAGNETIC

Aeromagnetic is descriptive of data pertaining to the Earth's magnetic field which has been collected from an airborne sensor.

ALBEDO

The percentage of incoming radiation that is reflected by a natural surface such as the ground, ice, snow, water, clouds, or particulates in the atmosphere.

ALBERS EQUAL AREA PROJECTION

The Albers Equal Area projection is a method of projection on which the areas of all regions are shown in the same proportion of their true areas. The meridians are equally spaced straight lines converging at a common point, which is normally beyond the pole. The angles between them are less than the true angles. The parallels are unequally spaced concentric circular arcs centered on the point of convergence of the meridians. The meridians are radii of the circular arcs. The poles are normally circular arcs enclosing the same angle as that enclosed by the other parallels of latitude for a given range of longitude.

Albers Equal Area is frequently used in the ellipsoidal form for maps of the United States in the National Atlas of the United States, for thematic maps, and for world atlases. It is also used and recommended for equal-area maps of regions that are predominantly east-west in extent.

ANSI--American National Standards Institute

An ANSI standard implies a consensus of those substantially concerned with the scope and provisions of a product and is intended as a guide to aid the manufacturer, consumer, and the general public.

ANTHROPOGENIC

Relating to the scientific study of the origin of human beings and the results of their influence on nature.

APFO--Aerial Photography Field Office

The U.S. Department of Agriculture's APFO is managed by the Farm Service Agency (FSA). FSA was formerly known as the Agricultural Stabilization and Conservation Service (ASCS). APFO is the repository for all of the USDA's aerial photography. The archive contains over 50,000 rolls of film acquired over the last 40 years and includes over 14 million frames of coverage of the conterminous U.S., Alaska, and Hawaii. APFO provides photographic products to local county, State and Federal offices within the U.S. Department of Agriculture (USDA) including FSA, National Resources Conservation Service (NRCS), and the Forest Service. They also serve the general public with similar products upon request at the cost of reproduction.

ARC EXPORT

EXPORT creates an ARC/INFO interchange file to transfer coverages, INFO data files, text files, and other ARC/INFO files between various computer systems. An interchange file contains all coverage information and appropriate INFO file information in a fixed length, ASCII format. It can be fully or partially compressed as well as uncompressed ASCII depending upon the given EXPORT option.

ARC SECOND

1/3600th of a degree (1 second) of latitude or longitude.

ARC/INFO

ARC/INFO is a geographic information system (GIS) used to automate, manipulate, analyze, and display geographic data in digital form. ARC/INFO is a proprietary system developed and distributed by the Environmental Systems Research Institute, Inc., in Redlands, California.

ArcUSA

Designed by ESRI, ArcUSA is a general-purpose database used to generate thematic maps of the conterminous United States at the State and county levels. The database contains cartographic information, tabular information, and indices and is designed for a wide range of applications.

AREAL

Relating to or involving an area.

ASCENDING NODE

Direction satellite is traveling relative to the Equator. An ascending node would imply a northbound Equatorial crossing.

ASCII--American Standard Code for Information Interchange

A seven-bit code standard adopted to facilitate data interchange between computers and operating systems. These codes represent alphanumerics and special characters (for example, $, /, ?, !).

ASTRONOMIC

Pertaining to the science of astronomy. Astronomy is the science of the heavenly bodies (fixed stars, planets, satellites, and comets) their nature, distribution, magnitudes, motions, distances, periods of revolution, eclipses, etc.

ATOMIC-ABSORPTION SPECTROPHOTOMETRY

This destructive analytical technique is used to determine concentrations of specific chemical elements based on their emission or absorption of specific wavelengths of electromagnetic radiation.

ATTRIBUTES

Attributes, also called feature codes or classification attributes, are used to describe map information represented by a node, line, or area. For example, an attribute code for an area might identify it to be a lake or swamp; an attribute code for a line might identify a road, railroad, stream, or shoreline.

AVHRR--Advanced Very High Resolution Radiometer

The AVHRR is a broad-band, 4 or 5 channel scanner (depending on the model), sensing in the visible, near-infrared, and thermal infrared portions of the electromagnetic spectrum. This sensor is carried on NOAA's Polar Orbiting Environmental Satellites (POES), beginning with TIROS-N in 1978.

AZIMUTH

Azimuth is the angle of horizontal deviation, measured clockwise, of a bearing from a standard direction.

BATHYMETRY

The measurement of depths of water in oceans, seas, and lakes. Also, the information derived from such measurements.

BIL--Band-Interleaved-by-Line

BIL is a CCT tape format that stores all bands of satellite data in one image file. Scanlines are sequenced by interleaving all image bands. The CCT header appears once in a set.

BILINEAR

The term bilinear is referring to a bilinear interpolation. This is simply an interpolation with two variables instead of one.

BINARY

Based upon the integer two. Binary Code is composed of a combination of entities that can assume one of two possible conditions (0 or 1). An example in binary notation of the digits 111 would represent (1 X 2) + (1 X 2) + (1 X 2) = 4 + 2 + 1 = 7.

BIOME

A community of living organisms in a single major ecological region.

BIP--Band-Interleaved-by-Pixel

When using the BIP image format, each line of an image is stored sequentially, line 1 all bands, line 2 all bands, etc.

For example, the first line of a three-band image would be stored as p1b1, p1b2, p1b3, p2b1, p2b2, p2b3, where p1b1 indicates pixel one, band one, p1b2 indicates pixel one, band two, etc.

BIP-2--Band-Interleaved-by Pixel-Pair (CCT-X)

BIP-2 is a CCT tape format available only for MSS data acquired before 1979. Data in each of four vertical swaths are stored in a separate image file. Scanlines are sequenced and interleaved-by-pixel- pairs. The CCT header information is recorded on each image file. BIP-2 is sometimes referred to as CCT-X format.

BIT--BInary digiT

A bit is most commonly a unit of information equaling one binary decision, or one of two possible and equally likely values or states. It is usually represented as a 1 or 0.

BLM--Bureau of Land Management, Department of the Interior

Under the Federal Land Policy and Management Act of 1976, the BLM administers and manages approximately 300 million acres of public lands primarily located in the western half of the lower 48 States and Alaska. Public lands in the U.S. contain mineral and timber reserves, support habitat for a host of wildlife, and provide recreational opportunities.

BOR--Bureau of Reclamation, Department of the Interior

The BOR was chartered in 1902 with the responsibility to reclaim arid lands in the western U.S. for farming by providing secure, year-around water supplies for irrigation. The BOR's responsibilities since have expanded to include generating hydroelectric power; overseeing municipal and industrial water supplies, river regulation, and flood control; enhancing fish and wildlife habitats; and researching future water and energy requirements.

BPI--Bits Per Inch

The tape density to which the digital data were formatted.

BSQ--Band-Sequential

BSQ is a CCT tape format that stores each band of satellite data in one image file for all scanlines in the imagery array. The CCT headers are recorded on each band.

BYTE

Several (usually eight) binary bits of data grouped together to represent a character, digit, or other value.

BYTE SWAPPED

The order in which the bits are kept in computer memory is typically with the eight most significant bits first, followed by the eight least significant bits (e.g., 511 appears as 0000000111111111). Some computer systems store data in the reverse form (e.g., 511 appears as 1111111100000001). When data are stored in this fashion, they are commonly referred to as being byte swapped. This effect is of concern to users for data values greater than 8-bit bytes (255).

CARBON CYCLE

The natural cycle of carbon dioxide to carbohydrates by photosynthesis and its return to the atmosphere by animal metabolism and decomposition.

CARTOGRAPHIC

Pertaining to cartography, the art or practice of making charts or maps.

CCT--Computer Compatible Tape

CCTs are 1/2-inch-wide magnetic tapes. The term is used in reference to both single tapes and tape sets consisting of a single logical volume of data.

CD-ROM--Compact Disc-Read Only Memory

CD-ROM is a computer peripheral that employs compact disc technology to store large amounts of data for later retrieval. The capacity of a CD-ROM disk is over 600 megabytes, the equivalent of over 250,000 typewritten pages.

CHANNELS

A range of wavelength intervals selected from the electromagnetic spectrum.

CHIP

A chip is an image subset window and is used in the correlation process.

CLIMATOLOGY

The science of climates and their phenomena.

CLUSTER

A homogeneous group of units which vary "like" one another. "Likeness" is usually determined by the association, similarity, or distance among the measurement patterns associated with the units.

COLLAR

Textual and symbolic information around the central map area on a topographic map. The collar is often removed from topographic map images to support mosaiking and display of adjacent map sections in GIS.

CONCATENATE

In the LAS environment, concatenate is the overlaying of an input image with one image or a series of images using the lines and samples to calculate the projection coordinates in the creation of a mosaicked image.

CONTOUR

Imaginary line on the ground, all points of which are at the same elevation above or below a specified datum.

COVARIANCE MATRIX

A matrix containing the expected values derived from the products of the deviations of pairs of random variables from their means. Covariance measures the extent to which two random numbers vary together (i.e., varying at the same rate in the same direction).

CPES--Control Point Extraction System

CPES is software used to produce and process a single-band (Band 4) Landsat chip.

CPT--Control Point

CPTs are features of known ground location that can be accurately located on imagery.

CRYOSPHERE

The part of the Earth's surface that is perennially frozen; the zone of the Earth where ice and frozen ground are formed.

CUBIC CONVOLUTION

A high order resampling technique in which the brightness value of a pixel in a corrected image is interpolated from the brightness values of the 16 nearest pixels around the location of the corrected pixel.

DACS--Data Acquisition and Control Subsystems

NOAA's header quality information file.

DANGLING ARC

An arc having the same polygon on both its left and right sides and having at least one node that does not connect to any other arc. See dangling node.

DANGLING NODE

The dangling endpoint of a dangling arc. Often identifies that a polygon does not close properly (e.g., undershoot), that arcs do not connect properly, or that an arc was digitized past its intersection with another arc (e.g., overshoot). In many cases, a dangling node may be acceptable. For example, in a street centerline map, cul-de-sacs are often represented by dangling arcs.

DATUM

In surveying, a reference system for computing or correlating the results of surveys. There are two principal types of datums: vertical and horizontal. A vertical datum is a level surface to which heights are referred. In the United States, the generally adopted vertical datum for leveling operations

is the national geodetic vertical datums of 1929 (differing slightly from mean sea level). The horizontal datum, used as a reference for position, is defined by: the latitude and longitude of an initial point, the direction of a line between this point and a specified second point, and two dimensions which define the spheroid. In the United States, the initial point for the horizontal datum is located at Meades Ranch in Kansas.

DBMS--Data Base Management System

A DBMS is software that supports processes germane to organizing, cataloging, locating, storing, retrieving, and maintaining data (i.e., information) in a data base.

DCRsi--Digital Cassette Recording system incremental

The DCRsi rack mount and modular ruggedized systems are one-inch, transverse scan, rotary digital recorders capable of recording and reproducing at any user data rate from 0 to 13.4 Mbytes/seconds (0-107 Mbits/seconds). DCRsi is a user friendly mass storage data peripheral with a total storage capacity of 48 gigabytes.

DDR--Data Descriptor Record

A DDR is a file containing image information which may include: (1) number of lines, number of samples, number of bands, data type, and the system on which the data was created; (2) corner coordinates of the image and related projection information; (3) the minimum and maximum values for each band of an image; (4) information describing how and when each band of the image was acquired; and (5) miscellaneous information (e.g., the last date and time modifications were made to an image).

DELAYED NEUTRON ACTIVATION ANALYSIS

This non-destructive analytical technique is used to determine concentrations of specific chemical elements. The procedure is based on artificially induced neutron capture and the radioactive decay constants of unstable radionuclides that are produced.

DEM--Digital Elevation Models

The U.S. Geological Survey produces five primary types of digital elevation model data. They are:

7.5-minute DEM (30- x 30-m data spacing, cast on Universal Transverse Mercator (UTM) projection or 1- x 1-arc-second data spacing). Provides coverage in 7.5- x 7.5-minute blocks. Each product provides the same coverage as a standard USGS 7.5-minute map series quadrangle. Coverage: Contiguous United States, Hawaii, and Puerto Rico.

1-degree DEM (3- x 3-arc-second data spacing). Provides coverage in 1- x 1-degree blocks. Two products (three in some regions of Alaska) provide the same coverage as a standard USGS 1-x 2-degree map series quadrangle. The basic elevation model is produced by or for the Defense Mapping Agency (DMA), but is distributed by USGS in the DEM data record format. Coverage: United States.

30-minute DEM (2- x 2-arc-second data spacing). Consists of four 15- x 15-minute DEM blocks. Two 30-minute DEMs provide the same coverage as a standard USGS 30- x 60-minute map series quadrangle. Saleable units will be 30- x 30-minute blocks, that is, four 15- x 15-minute DEMs representing one half of a 1:100,000-scale map. Coverage: Contiguous United States, Hawaii.

15-minute Alaska DEM (2- x 3-arc-second data spacing, latitude by longitude). Provides coverage similar to a 15-minute DEM, except that the longitudinal cell limits vary from 20 minutes at the southernmost latitude of Alaska to 36 minutes at the northern most latitude limits of Alaska. Coverage of one DEM will generally correspond to a 1:63,360-scale quadrangle.

7.5-minute Alaska DEM (1- x 2-arc-second data spacing, latitude by longitude). Provides coverage similar to a 7.5-minute DEM, except that the longitudinal cell limits vary from 10 minutes at the southernmost latitude of Alaska to 18 minutes at the northernmost latitude limits of Alaska.

DEMODULATION

The process of recovering a signal from a modulated (varied frequency) carrier wave.

DESCENDING NODE

Direction satellite is traveling relative to the Equator. A descending node would imply a southbound Equatorial crossing.

DIGITAL COUNT

Digital count is the total number of pixels occurring in an image for each possible data value.

DIGITIZATION

Digitization of graphics typically involves recording the location of each point, line, and polygon on a map, along with their associated labels and attributes.

DLG--Digital Line Graph

A DLG is line map information in digital form. The DLG data files include information about planimetric base categories, such as transportation, hydrography, and boundaries.

DLG OPTIONAL FORMAT

The USGS digital line graph (DLG-3) optional format, which was designed for data interchange, allows for the creation of a vector polygon data structure. The topological linkages are explicitly encoded for node, area, and line elements. The files are composed of 8-bit ASCII characters organized into fixed logical records of 80 bytes. Bytes 1 - 72 contain the data, bytes 73 - 77 are blank, and bytes 78 - 80 contain a record sequence number. The detailed description of the DLG-3 optional format is described in Digital Line Graphs from 1:2,000,000-Scale Maps, Data Users Guide 3 (1990).

DLG STANDARD FORMAT

The DLG Standard Format is no longer distributed. Designed to minimize data storage, the topological linkages of the USGS DLG standard format are only contained in the line elements. The files are comprised of standard 8-bit ASCII characters organized into fixed length records of 144 bytes. Nine distinct record types are defined in this format. Coordinates are expressed as integer mils (one unit = .001") in a Cartesian coordinate system. The origin is positioned at the center of the DLG cell. The coordinate domain is limited to the range -32768 and +32767. These values must be transformed using coefficients stored in the header record of the file to convert to the original Albers Equal-Area coordinates.

DMA--Defense Mapping Agency

The DMA was established in 1972, when mapping, charting, and geodesy functions of the Defense Community were combined into this joint Department of Defense agency. The mission of the Agency is to: produce and distribute to the Joint Chiefs of Staff, unified and specified commands, military departments, and other department of defense users, timely and

uniquely tailored mapping, charting, and geodetic products, services, and training; provide nautical charts and marine navigational data to worldwide merchant marine and private vessel operators; and maintain liaison with civil agencies and other national and international scientific and other organizations engaged in mapping, charting, and geodetic activities.

The above activities were handled by the DMA Combat Support Center until the Center was disbanded in 1995 and responsibilities were transferred to the National Imagery Mapping Agency

DODGING

Dodging is a process used to lighten areas of a photographic print during the main exposure so that the areas which need lightening receive less than the regular exposure. This process, which generally provides more image detail and reduces scene contrast, is performed by a skilled technician using their hands or a paddle over the area in need of less exposure.

DOMSAT--Domestic Satellite

A system that utilizes a geosynchronous satellite to re-broadcast satellite data received at a central reception and preprocessing center.

DOPPLER SYSTEM

The Doppler system is used to correlate total aeromagnetic readings with the position of the aircraft at the instant readings are taken. The information is then used for mapping aeromagnetic data. The Doppler system is self contained in the aircraft and emits a pulsed or continuous microwave which is sent diagonally downward fore and aft. The frequencies are then compared in order to obtain true ground speed. The heading is obtained from a special magnetic compass and is maintained by a directional gyro used as an integrating device. The distance thus determined has a precision better than one part in a thousand, which is sufficient for most geophysical surveys.

DOS--Disk Operating System

DOS commonly refers to the disk operating system originally developed by MicroSoft, Inc. for use on personal computers. This operating system also refers to that operating system which is used on IBM-compatible personal computers.

DOUGLAS - PEUCKER

An algorithm developed by David H. Douglas (University of Ottawa) and Thomas K. Peucker (Simon Fraser University, British Columbia). This formula was designed to reduce the number of points required to represent a digitized line from a map.

Reducing the number of points saves storage space and also allows for generalization of lines that are very complex.

DRAINAGE BASIN

Geographic area or region containing one or more drainage areas that discharge run-off to a single point.

DTM--Digital Terrain Model

A DTM is a land surface represented in digital form by an elevation grid or lists of three-dimensional coordinates.

EBCDIC--Extended Binary Coded Decimal Interchange Code

An 8-bit character encoding scheme used primarily on IBM machines.

ECOSYSTEM

An ecologic system composed of interacting organisms and their environments. The result of interaction between biological, geochemical and geophysical systems.

EDAC--Earth Data Analysis Center

EDAC, also known as the Technology Applications Center (TAC), has served as a NASA center since 1964. EDAC operates under the objective of transferring Earth-observing technologies to the user community. It supports and works directly with industries developing technologies related to space science and collaborating with them to enhance and encourage the user community to adopt the new technologies. EDAC also supports and works with public agencies, private citizens, educational organizations, and volunteer groups to ensure ready accessibility to NASA generated space imagery.

EDC--Earth Resources Observation Systems Data Center

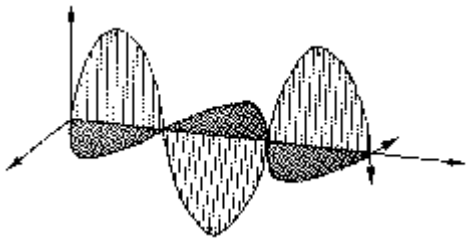
EDC is a national archive, production, distribution, and research facility for remotely sensed data and other geographic information. See also EROS.

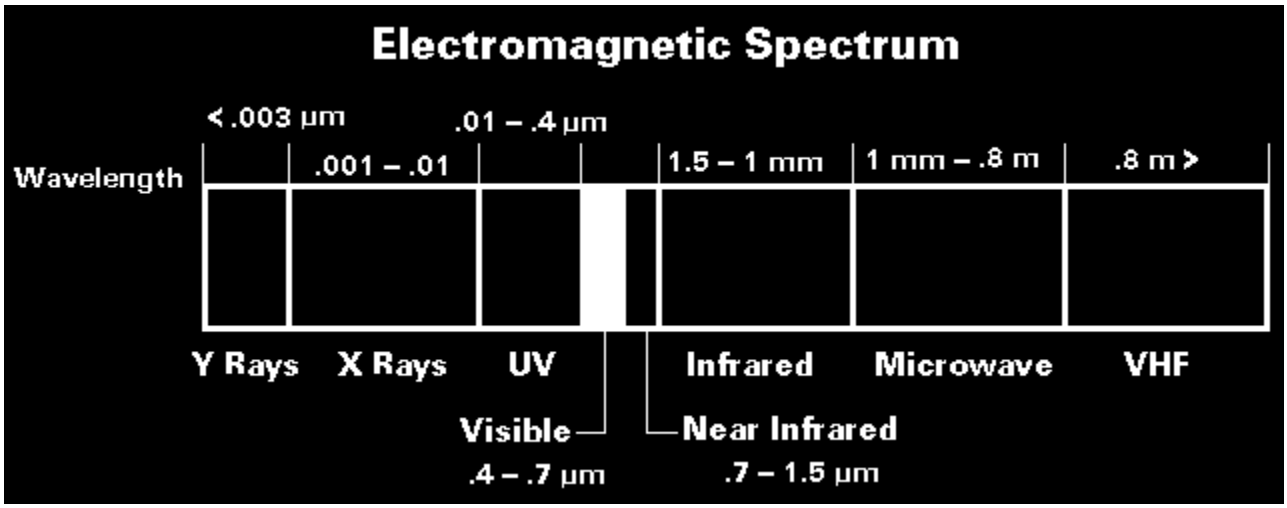
IPS--Space Imaging Image Processing System

EIPS is software that calculates the maximum number of image lines that can be consolidated into a tape record.

ELECTROMAGNETIC SPECTRUM

Electromagnetic radiation is energy propagated through space between electric and magnetic fields. The electromagnetic spectrum is the extent of that energy ranging from cosmic rays, gamma rays, X-rays to ultraviolet, visible and infrared radiation including microwave energy.





EMISSION SPECTROGRAPHY

This destructive analytical technique is used to determine concentrations of specific chemical elements based on their emission or absorption of specific wavelengths of electromagnetic radiation.

SPACE IMAGING

The U.S. Government transferred commercial sales rights of the Landsat program to the private sector on September 27, 1985, authorizing a contract with the Space Imaging. The Landsat program involves satellite

remote sensing of the Earth's resources and the dissemination of that data to users worldwide.

Space Imaging is a joint venture/partnership formed by Hughes Aircraft Company and RCA Corporation.

EPA--Environmental Protection Agency

Established on December 2, 1970, the EPA is charged with protecting and enhancing the environment for present and future generations to the fullest extent possible under Congressional law with responsibilities including the control of solid waste, pesticides, radiation, and toxic substances, and the abatement of air and water pollution. The EPA coordinates research and antipollution activities with State and local governments, educational institutions, private and public groups, and individuals.

EPHEMERIS

A table of predicted satellite orbital locations for specific time intervals. The ephemeris data help to characterize the conditions under which remotely sensed data are collected and are commonly used to correct the sensor data prior to analysis.

EROS--Earth Resources Observation Systems

The EROS program was established in the early 1970s, under the Department of the Interior's U.S. Geological Survey, to receive, process, and distribute data from United States Landsat satellite sensors and from airborne mapping cameras. See also EDC.

ESIC--Earth Science Information Center

The U.S. Geological Survey (USGS) operates a network of ESICs designated to distribute USGS earth science data and related products. There are more than 75 ESIC offices throughout the United States. Major offices are managed by the USGS, but numerous affiliate offices are managed by various State and Federal agencies.

ESRI--Environmental Systems Research Institute

Headquartered in Redlands, California, ESRI provides Geographic Information System (GIS) software, products, and services.

EXPORT

EXPORT creates an ARC/INFO interchange file to transfer coverages, INFO data files, text files, and other ARC/INFO files between various computer systems. An interchange file contains all coverage information and appropriate INFO file information in a fixed length, ASCII format. It can be fully or partially compressed as well as uncompressed ASCII depending upon the given EXPORT option.

EXTRAPOLATE

To infer (values of a variable in an unobserved interval) from values within an already observed interval.

FAO--Food and Agriculture Organization

The FAO is based out of Rome, Italy, to monitor, conduct research, and promote good practices in the area of food and agriculture throughout the world.

FGDC--Federal Geographic Data Committee

The FGDC provides Federal leadership in the evolution of the National Spatial Data Infrastructure (NSDI) in cooperation with State and local governments, academia, and the private sector. The FGDC was established through the U.S. Office of Management and Budget (OMB) Circular A-16 and charged with the responsibility to coordinate various surveying, mapping, and spatial data activities of Federal agencies to meet the needs of the United States. Major objectives of Circular A-16 are to avoid duplication and minimize costs in mapping and spatial data activities, which involves establishing standards and providing wider access to geospatial data. The FGDC also has been charged with coordinating geospatial data related activities with other levels of government and other sectors.

FIDUCIAL MARKS

A set of four marks located in the corners or edge-centered, or both, of a photographic image. These marks are exposed within the camera onto the original film and are used to define the frame of reference for spatial measurements on aerial photographs. Opposite fiducial marks connected, intersect at approximately the image center of the aerial photograph.

FILM TYPES

Photographic products for use in image interpretation are commonly generated from the following film types:

- Black-and-White Panchromatic (B&W): This film primarily consists of a black-and-white negative material with a sensitivity range comparable to that of the human eye. It has good contrast and resolution with low graininess and a wide exposure range.
- Black-and-White Infrared (BIR): With some exceptions, this film is sensitive to the spectral region encompassing 0.4 micrometers to 0.9 micrometers. It is sometimes referred to as near-infrared film because it utilizes only a narrow portion of the total infrared spectrum (0.7 micrometers to 0.9 micrometers).
- Conventional Color: This film contains three emulsion layers that are sensitive to blue, green, and red (the three primary colors of the visible spectrum). This film replicates colors as seen by the human eye and is commonly referred to as normal or natural color. Color film is a valuable image interpretation tool because the human eye can discern a greater variety of color tones than gray tones.
- Color Infrared (CIR): This film, originally referred to as camouflage-detection film because of its warfare applications, differs from conventional color film because its emulsion layers are sensitive to green, red, and near-infrared radiation (0.5 micrometers to 0.9 micrometers). Used with a yellow filter to absorb the blue light, this film provides sharp images and penetrates haze at high altitudes. Color-infrared film also is referred to as false-color film.

FIPS--Federal Information Processing Standard

The U.S. National Institute of Standards and Technology (NIST) is responsible for developing standards, guidelines, and associated methods and techniques for computer systems, including those needed to assure the cost-effective security and privacy of sensitive information in U.S. Federal computer systems. NIST adopts and publicizes U.S. FIPS standards under the provisions of Section 111(d) of the U.S. Federal Property and Administrative Services Act of 1949 as amended by the Computer Security Act of 1987.

FLUORIMETRY

This non-destructive analytical technique is used to determine concentrations of specific chemical elements. The procedure is based on the artificially induced absorption, atomic excitation, and emission of electromagnetic radiation at characteristic wavelengths.

FORTRAN--FORmula TRANslator

FORTRAN is a computer programming language. This mathematically oriented language primarily is intended for scientific data processing.

GAC--Global Area Coverage

GAC data are derived from a sample averaging of the full resolution AVHRR data. Four out of every five samples along the scan line are used to compute one average value and the data from only every third scan line are processed, yielding 1.1 km by 4 km resolution at the subpoint.

GAIN COEFFICIENT

Gain coefficient is a measurement to denote an increase in signal power in transmission from one point to another.

GAMMA

This is a unit of magnetic intensity.

GAMMA-RAY DATA

Gamma-ray data are high frequency, penetrating radiation emitted from the nucleus of a radioactive atom.

GAMMA-RAY SPECTROSCOPY

This non-destructive analytical technique is used to determine concentrations of specific chemical elements such as potassium, thorium, and uranium. These elements have naturally occuring radioactive isotopes based on their normal radioactive decay and the associated emission of gamma-rays at specific wavelengths.

GAUSS-SEIDEL

The Gauss-Seidel method is a technique for interpolating irregularly spaced data points, such as spot elevations, onto a regular grid (e.g., Digital Elevation Models). Unlike simple interpolation methods which assume only correlation, the Gauss-Seidel method is used when some characteristics of the system are known, such as the local value of a derivative. This method, which must be solved iteratively, takes the form of an implicit equation.

The Successive Over Relaxation (SOR) method, a refinement to the Gauss-Seidel method, causes the system to converge more rapidly so fewer iterations are required to achieve the same result.

GCP--Ground Control Point

GCPs are physical points on the ground whose positions are known with respect to some horizontal coordinate system and/or vertical datum. When mutually identifiable on the ground and on a map or photographic image, ground control points can be used to establish the exact spatial position and orientation of the image to the ground. Ground control points may be either horizontal control points, vertical control points, or both.

GCTP--General Cartographic Transformation Package

The official U.S. Geological Survey (USGS) map projection software library, the GCTP is a system of software routines designed to permit the transformation of coordinate pairs from one map projection to another. The GCTP is the standard computer software used by the National Mapping Division for map projection computations.

GEODETIC

Of or determined by geodesy; that part of applied mathematics which deals with the determination of the magnitude and figure either of the whole Earth or of a large portion of its surface. Also refers to the exact location points on the Earth's surface.

GEODETIC ACCURACY

The accuracy with which geographic position and elevation of features on the Earth's surface are mapped. This accuracy incorporates information in which the size and shape of the Earth has been taken into account.

GEOREGISTERED

An image that has been geographically referenced or rectified to an Earth model, usually to a map projection. Sometimes referred to as geocoded or geometric registration.

GIRAS--Geographic Information Retrieval and Analysis System

GIRAS reflects the judgement of the USGS concerning the presentation and format of polygonal data. The GIRAS data structure was designed to handle large quantities of data for a map area. With the data structure, the

basic topological elements (arcs, nodes, and polygons) are all uniquely identified and cross-referenced to one another.

GIS--Geographic Information System

A system, usually computer based, for the input, storage, retrieval, analysis and display of interpreted geographic data. The data base is typically composed of map-like spatial representations, often called coverages or layers. These layers may involve a three-dimensional matrix of time, location, and attribute or activity. A GIS may include digital line graph (DLG) data, digital elevation models (DEM), geographic names, land-use characterizations, land ownership, land cover, registered satellite and/or aerial photography along with any other associated or derived geographic data.

GISS--Goddard Institute of Space Studies

Based out of New York, New York, GISS, one of NASA's Goddard Space Flight Center research facilities, institutes activities involving research and analysis in specialized subjects, including climate, biogeochemical cycles, remote sensing, and planetary atmospheres.

GLOBAL CHANGE MASTER DIRECTORY

The Master Directory (MD) is an online computer-based system designed to enable rapid identification and location of data of interest to earth and space science researchers. It provides brief, high level data set information from which the user should be able to identify data of potential interest. The Master Directory has remote linking capabilities to a number of other online data directories.

The MD resides on a VAX at the National Space Science Data Center (NSSDC) and may be reached from GLIS by selecting the Remote Option (6) on the GLIS Main Menu screen.

GMT--Greenwich Mean Time

GMT is the mean solar time of the meridian of Greenwich used as the prime basis of standard time throughout the world.

GPS--Global Positioning System

The GPS is a worldwide satellite navigation system that is funded and supervised by the U.S. Department of Defense. GPS satellites transmit specially coded signals. These signals are processed by a GPS receiver

that computes extremely accurate measurements, including 3-dimensional position, velocity, and time on a continuous basis. [Woods Hole Field Center]

GRASS--Geographic Resources Analysis Support System

GRASS is a product of the U.S. Army Corps of Engineers Construction Engineering Research Laboratories (USACERL) in Champaign, Illinois. It is an integrated set of programs designed to provide digitizing, image processing, map production, and geographic information system capabilities to its users.

GRAVIMETRIC

Relating to weight measurement. A GRAVIMETER is an instrument used for determining the specific gravity of bodies, solid or liquid.

GSFC--Goddard Space Flight Center

The NASA GSFC was established in 1959 just northeast of Washington, D.C. Goddard's mission is to expand knowledge of the Earth, its environment, the solar system and the universe through the development and use of near-Earth orbiting spacecraft. The GSFC is responsible for supporting NASA's leadership role in space and Earth sciences; research and application of technology for sensors, instruments and information systems; planning and executing space flight projects for scientific research; and for tracking of manned and unmanned Earth satellites through worldwide ground and space communication systems.

GVI--Global Vegetation Index

The GVI is a specific AVHRR application that uses global area coverage (GAC) data to produce a vegetative index called the normalized difference vegetation index (NDVI). GAC data are processed daily and then composited on a weekly basis to produce a global map portraying vegetation vigor.

GZIP

Gzip reduces the size of the named files using Lempel-Ziv coding (LZ77). Whenever possible, each file is replaced by one with the extension .gz, while preserving the same ownership modes, access, and modification times. The gzip programs for UNIX, Macintosh, and DOS environments are available at the following websites.

HASSELBLAD 500 EL/M 70-MM CAMERAS

NASA has modified standard off-the-shelf Hasselblad 70 mm cameras to operate in zero gravity aboard the Space Shuttle. A data recording module (DRM) has also been installed on each camera to record the date, time (Greenwich Mean Time), mission number, roll number, and frame number. The cameras utilize a 70 mm film format and operate with one of three lenses (50, 100, or 250 mm) to acquire high quality photographs through four viewing ports on the Shuttle.

HDT--High Density Tapes

HDTs are high density (high capacity) magnetic tapes.

HORIZONTAL INTEGRATION

The process of mosaicking adjacent parts of a map or image together into a single map or image. This process might require geometric adjustments to the image itself or the features within it so that matching occurs across mosaic seams.

HORIZONTAL POLARIZATION

Transmission of microwaves so that the electric lines of force are horizontal, while the magnetic lines of force are vertical.

HORIZONTAL POSITIONAL ACCURACY

Horizontal positional accuracy is based upon the use of USGS source quadrangles which are compiled to meet National Map Accuracy Standards (NMAS). NMAS horizontal accuracy requires that at least 90 percent of points tested are within 0.02 inches of the true position. The digital data are estimated to contain a horizontal positional error of less

than or equal to 0.003 inches standard error in the two component directions relative to the source quadrangle.

HRPT--High Resolution Picture Transmission

HRPT data are full resolution image data transmitted to a ground station as they are collected. The average instantaneous field-of-view of 1.4 milliradians yields a HRPT ground resolution of approximately 1.1 km at the satellite nadir from the nominal orbit altitude of 833 km (517 mi).

HRV--High Resolution Visible Imaging Instrument

The HRV instrument is a multispectral radiometer designed for SPOT spacecraft. The HRV instrument provides for high-resolution imaging in the visible and near-infrared portions of the electromagnetic spectrum. The first three SPOT satellites carry twin HRVs that operate in a number of viewing configurations and in different spectral modes.

Some of those viewing configurations and spectral modes include one HRV only operating in a dual spectral mode (i.e., in both panchromatic mode and multispectral mode); two HRVs operating in the twin-viewing configuration (i.e., one HRV in panchromatic mode and one HRV in multispectral mode); and two HRVs operating independently of each other (i.e., not in twin-viewing configuration).

HYDROLOGY

Scientific study of the waters of the Earth, especially with relation to the effects of precipitation and evaporation upon the occurrence and character of ground water.

HYPERTEXT

The use of links between related words, graphics, or documents that allow the user to jump to associated topics or definitions when reading menus or help files.

HYPSOGRAPHY

The scientific study of the Earth's topologic configuration above sea level, especially the measurement and mapping of land elevation.

I*2 INTEGER

A format of data whose values are represented by 16-bit words. Data distributed as I*2 format can have values ranging between -32,768 to +32,767. This format is commonly used for digital elevation and other data which requires values higher than the 0 to 255 range available for 8-bit (byte) data used for many remote sensing satellite image data.

IFOV--Instantaneous Field-of-View

IFOV is the solid angle through which a detector is sensitive to radiation. In a scanning system this refers to the solid angle subtended by the detector when the scanning motion is stopped. The IFOV is commonly expressed in milliradians.

IMDISP

The IMDISP is an interactive IMage DISPlay utility for personal computers. It can be used to display and manipulate raster images on a PC's monitor screen, as well as being used to perform basic digital image processing tasks such as histograms and contrast enhancement.

When accessing raster images using IMDISP, the program requires the user to supply information about the size, type, and location the image file to be displayed. This information can be entered manually or can be provided in an ASCII label file. This label file can be located at the beginning of an IMDISP formatted image file or can be a separate file that points to the image file.

The IMDISP is public domain software developed by Mike Martin at NASA's Jet Propulsion Laboratory in Pasadena, California, and supported by the NASA Goddard Space Flight Center in Greenbelt, Maryland.

INTERCEPT

Intercept is the distance from the origin to the point at which a curve or line crosses an axis.

INTERPOLATE

To insert a value between known values by using a procedure or algorithm specifically related to the known values.

ISO--International Organization for Standardization

The ISO is a specialized international agency established to maintain standardization. Over 85 countries are participating members. Only one organization from each participating country may be a member. As an example ANSI is the United States member body. Members contribute to technical committees and vote for or against the approval of developed standards.

ISO 9660

The ISO 9660 standard is the currently accepted industry standard for Compact Disc-Read Only Memory (CD-ROM). This standard assures the generation of CD-ROMs whose format is compatible with a multitude of computer platforms supporting IBM compatible DOS, Apple Macintosh, and Unix operating systems.

ISOMETRIC PROJECTION

A method of drawing figures and maps so that three dimensions are shown not in perspective but in their actual measurements.

ISOPLETH

A line on a map connecting points at which a given variable has a specified constant value.

ISOTOPE-DILUTION MASS SPECTROMETRY

This destructive analytical technique is used to determine concentrations of specific chemical elements based on their rates of molecular diffusion in a gaseous or vaporous mixture. A known quantity of the chemical element in question is added to the mixture. This quantity, referred to as a tracer, is monitored to measure its diffusion rate.

ISOTOPIC AGE

Isotopic age, also referred to as radiometric age, is an age of rocks expressed in years and calculated from the quantitative determination of radioactive elements and their decay products.

JNC--Jet Navigation Chart

The JNC series provides worldwide coverage at 1:2,000,000 scale. The information on these charts are suitable for aeronautical long-range, high-altitude, high-speed travel; map features include cities, roads, railroads,

lakes, principal drainage, and permanent snow/ice areas. The polar regions are in a Transverse Mercator projection. All other regions are presented in the Lambert Conformal Conic projection.

KELVIN UNITS

A Kelvin Unit refers to a thermometric scale in which the degree intervals are equal to those of the Celsius scale and in which zero(0) degrees equals -273.15 degrees Celsius (absolute zero).

LAC--Local Area Coverage

LAC are full resolution data that are recorded on an onboard tape recorder for subsequent transmission during a station overpass. The average instantaneous field-of-view of 1.4 milliradians yields a LAC ground resolution of approximately 1.1 km at the satellite nadir from the nominal orbit altitude of 833 km (517 mi).

LAMBERT AZIMUTHAL EQUAL AREA PROJECTION

Azimuthal projections are formed onto a plane which is usually tangent to the globe at either pole, the Equator, or any intermediate point. The Lambert Azimuthal Equal Area projection is a method of projecting maps on which the azimuth or direction from a given central point to any other point is shown correctly and also on which the areas of all regions are shown in the same proportion of their true areas. When a pole is the central point, all meridians are spaced at their true angles and are straight radii of concentric circles that represent the parallels.

This projection is frequently used in one of three aspects: The polar aspect is used in atlases for maps of polar regions and of the Northern and Southern Hemispheres; the equatorial aspect is commonly used for atlas maps of the Eastern and Western Hemispheres; and the oblique aspect is used for atlas maps of continents and oceans.

LAMBERT CONFORMAL CONIC PROJECTION

The Lambert Conformal Conic Projection is derived by the projection of lines from the center of the globe onto a simple cone. This cone intersects the Earth along two standard parallels of latitude, both of which are on the same side of the equator. All meridians are converging straight lines that meet at a common point beyond the limits of the map. Parallels are concentric circles whose center is at the intersection point of the meridians. Parallels and meridians cross at right angles, an essential of conformality.

To minimize and distribute scale errors, the two standard parallels are chosen to enclose two-thirds of the north to south map area. Between these parallels, the scale will be too small, and beyond them, too large. If the north to south extent of the mapping is limited, maximum scale errors will rarely exceed one percent. Area exaggeration between and near the standard parallels, is very slight; thus, the projection provides good directional and shape relationships for areas having their long axes running in an east to west belt.

LANDSAT (formerly ERTS)

The Landsat program, first known as the Earth Resources Technology Satellite (ERTS) Program, is a development of the National Aeronautics and Space Administration (NASA) in association with NOAA, USGS, and the Space Imaging. The activities of these combined groups led to the concept of dedicated Earth-orbiting satellites, the defining of spectral and spatial requirements for their instruments, and the fostering of research to determine the best means of extracting and using information from the data. The first satellite, ERTS 1, was launched on 7/23/72. The second satellite was launched on 1/22/75. Concurrently the name of the satellites and program was changed to emphasize its prime area of interest (land resources). The first two satellites were designated as Landsats 1 and 2. Landsat 3 was launched on 3/5/78. Landsat 4 was launched on 7/16/82. Landsat 5 (launched 3/1/84) is currently in service providing selected data to worldwide researchers.

LAS--Land Analysis System

The LAS is an image analysis system designed to ingest, manipulate, and analyze digital image data by providing the user with a wide array of functions and statistical tools. LAS supports research and production for remote sensing, image processing, and geographic information systems (GIS). It provides a flexible framework for the processing and the analysis of image data as well as for algorithm development. It is the main software system for the production image processing capabilities at the U.S. Geological Survey's EROS Data Center (EDC).

LAS HEADER

A LAS image header contains descriptive information about an image file. This header is located in the first 512-byte record of the image file. This information record is mandatory for all LAS images accessed directly from computer or optical disk.

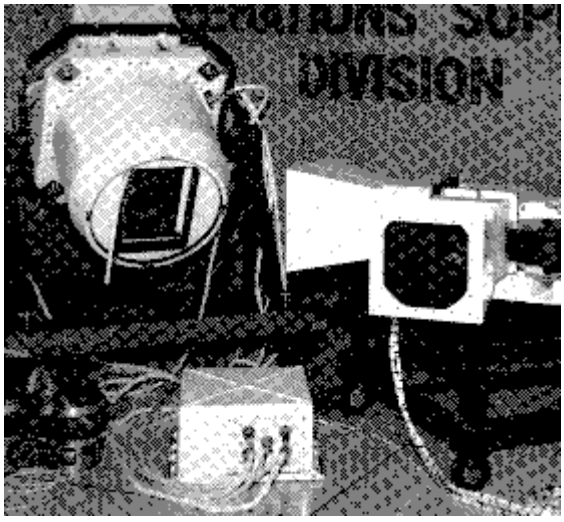
LEVEL 1b

Level 1b is considered raw quality controlled data configured into discrete data sets and to which Earth location and calibration information have been appended, but not applied.

LFC--Large Format Camera

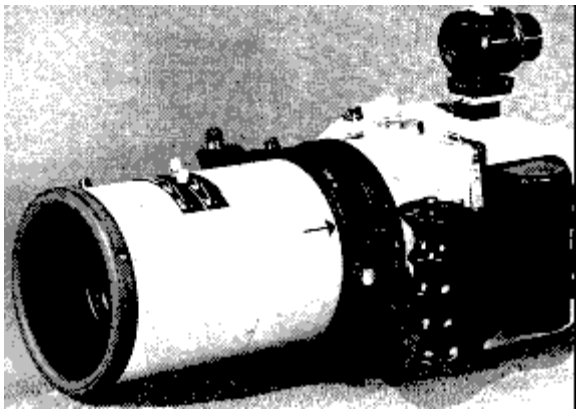
The LFC was a high altitude aerial mapping camera scaled up to operate from the Space Shuttle in Earth-orbital altitudes. LFC specifications included:

-Film Format Size: 9 x 18 inches (23 x 46 cm) -Lens Aperture: F/6.0 -Lens Focal Length: 12 inches (30.5 cm) -Exposure Interval: 7.5 sec. -Exposure Range: 1/250 to 1/31.25 seconds -Ground Resolution: 20 meters at 160 nautical miles -Ground Coverage: 120 x 240 nautical miles at 160 n.m.



LINHOF AERO TECHNIKA CAMERAS

NASA has modified the Linhof cameras to operate in zero gravity on board the Space Shuttle. The camera utilizes a five-inch film format and is equipped with interchangeable lenses (90 mm and 250 mm). A data recording module (DRM) is also mounted on the camera to record the date, time (Greenwich Mean Time), mission number, roll number, and frame number for each photograph. The Linhof camera is used to acquire earth-looking photography through four viewing ports on board the Shuttle.



MEAN EARTH-SUN DISTANCE

Mean Earth-Sun distance is the arithmetical mean of the maximum and minimum distances between a planet (Earth) and the object about which it revolves (Sun).

MERCATOR PROJECTION

Mercator is a conformal map projection, that is, it preserves angular relationships. Mercator was designed and is recommended for navigational use and is the standard for marine charts. Mercator is often and inappropriately used as a world map projection in atlases and for wall charts where it presents a misleading view of the world because of the excessive distortion of area in the higher latitude areas.

MICROMETERS

A unit of length equal to one-millionth of a meter. It also is referred to as a micron.

MICROWAVE

The subset of the Electromagnetic Spectrum encompassing wavelengths between .03 and 30 centimeters, corresponding to frequencies of 1-100 gigahertz.

MILLIRADIANS

Unit of angular measure equal to one-thousandth the angle subtended at the center of a circle by an area of length equal to the radius of the circle.

MMSP--Modular Multi-Satellite Preprocessor

The MMSP is a frame synchronizer designed to provide the interface between bit synchronized Landsat thematic mapper telemetry data and the host computer system. It is used as the front end for a Landsat data acquisition system that accepts raw serial telemetry data from high density tape (HDT), frame aligns, samples user specified fields, and presents these data to the host computer for decommutation and image extraction.

MODE

That value that occurs most frequently within the data sample being taken. In a histogram, it is the data value at which the peak of the distribution curve occurs.

MODULATION

The process by which some characteristics of one carrier wave are varied in relation to another wave or signal.

MOSS--Map Overlay Statistical System

The MOSS is a vector based GIS system that was first implemented in 1977 by the U.S. Bureau of Land Management.

MSS--Multispectral Scanner

The MSS is a nonphotographic imaging system which utilizes an oscillating mirror and fiber optic sensor array. The mirror sweeps from side to side, transmitting incoming energy to a detector array which sequentially outputs brightness values (signal strengths) for successive pixels, one swath at a time. The forward motion of the sensor platform carries the instrument to a position along its path where an adjacent swath can be imaged. The MSS simultaneously senses radiation using an array of six detectors in each of four spectral bands from 0.5 to 1.1 micrometers.

MULTISPECTRAL

The use of one or more sensors to obtain imagery from different portions of the electromagnetic spectrum.

NAD27--North American Datum of 1927

NAD27 is defined with an initial point at Meads Ranch, Kansas, and by the parameters of the Clarke 1866 ellipsoid. The location of features on USGS

topographic maps, including the definition of 7.5-minute quadrangle corners, are referenced to the NAD27.

NAD83--North American Datum of 1983

NAD83 is an Earth-centered datum and uses the Geodetic Reference System 1980 (GRS 80) ellipsoid, unlike NAD27, which is based on an initial point (Meades Ranch, Kansas). Using recent measurements with modern geodetic, gravimetric, astrodynamic, and astronomic instruments, the GRS 80 ellipsoid has been defined as a best fit to the worldwide geoid. Because the NAD83 surface deviates from the NAD27 surface, the position of a point based on the two reference datums will be different.

NADIR

Point on the ground vertically beneath the center of a remote sensing platform.

NAPP--National Aerial Photography Program

NAPP was established to coordinate the collection of aerial photography covering the 48 contiguous States and Hawaii every five years. NAPP's goals are to ensure that photography with uniform scale, quality, and cloud-free coverage be made available to meet the requirements of several Federal and State agencies. The program was initiated in 1980 as the National High Altitude Photography (NHAP) program. In 1987, the program was renamed to NAPP when the flying height for the program changed from 40,000 feet to 20,000 feet. NAPP photography is available in black and white, and in most cases, color-infrared. The program is administered by the U.S. Geological Survey's National Mapping Division. NAPP imagery is used by the USGS for photo revision and land use land cover characterization work on the standard series maps at 1:24,000; 1:100,000 and 1:250,000 scales.

NASA--National Aeronautics and Space Administration

The NASA was formed during the administration of President Dwight D. Eisenhower as a response by the President and the United States Congress to achievements in space by the then Union of Soviet Socialist Republics (USSR) including Sputnik I and II. Emphasis was placed on consolidating projects, facilities, and personnel into a national program including the National Advisory Committee for Aeronautics (NACA) which would later become the nucleus for the NASA. The NASA researches solutions to flight problems within and outside of the Earth's atmosphere. The NASA also develops, constructs, tests, and operates aeronautical and space vehicles. These vehicles, both manned and unmanned, are part of

the NASA's research activities in the exploration of space. In addition, the NASA coordinates the scientific and engineering resources of the United States with other nations engaged in aeronautical and space activities for peaceful purposes.

NASA/ARC--National Aeronautics and Space Administration/Ames Research Center

The ARC's two installations are located at Moffett Field, California, and at the Dryden Flight Research Facility in Edwards, California. The ARC is responsible for managing a diverse series of research and technology development programs in support of NASA activities including flight simulation and research; aerospace and human factors; atmospheric and Earth sciences applications; and space biology and medicine. The ARC also is responsible for maintaining research and test facilities and equipment including wind tunnels, simulators, supercomputers, and aircraft.

NASA/JSC--National Aeronautics and Space Administration/Johnson Space Center

NASA/JSC or JSC supports the acquisition of Earth observations photography by training the astronauts in Earth science and providing real-time mission support to make the crew aware of photo opportunities during the flight (i.e, hurricanes, fires, floods, volcanoes, ice flows, etc.). JSC also trains the crew to use the camera systems and the techniques needed to acquire high quality photography of Earth and environmental phenomena. After each mission JSC catalogs the acquired photography and enters new records into the Space Shuttle Earth Observation Program (SSEOP) data base. This data base is accessible from GLIS through the use of the REMOTE MENU option.

NATIONAL ATLAS

The National Atlas of the United States of America is a bound collection of full-color maps and charts showing physical features such as landforms, geology, soil, vegetation, and climate. It is produced by the U.S. Geological Survey's Topographic Division in cooperation with other Federal agencies and private organizations. Economic, social, and cultural information is also presented. All maps of the United States contained in the National Atlas are based on the Albers equal area projection.

NATIONAL GEODETIC VERTICAL DATUM OF 1929

Reference surface established by the U.S. Coast and Geodetic Survey in 1929 as the datum to which relief features and elevation data are

referenced in the conterminous United States; formerly called "mean sea level 1929."

NATIONAL MAP ACCURACY STANDARDS

Specifications promulgated by the U.S. Office of Management and Budget to govern accuracy of topographic and other maps produced by Federal agencies.

NATSGO--National Soil Geographic

The NATSGO data base is used primarily for national and regional resource appraisal, planning, and monitoring. The boundaries of the Major Land Resource Areas (MLRA) and regions were used to form the NATSGO data base.

NATURAL GAMMA

This is a technique of examining the total gamma radiation of rocks in a drill hole.

NCAR--National Center for Atmospheric Research

The NCAR, based out of Boulder, Colorado, performs research related to atmospheric problems. NCAR provides service to the university research community and conducts research toward achieving a better understanding of the overall behavior of the atmosphere, including analyzing and predicting atmospheric behavior, establishing solar terrestrial connections, understanding air chemistry and climate, evaluating environmental and societal effects, and studying connective storms and severe weather.

NCDS--NASA Climate Data System

The NCDS is an interactive scientific information management system that allows researchers to locate, access, manipulate, and display a wide variety of climate data. This data can be analyzed on the NCDS host computer or downloaded to other computers for additional analysis. The NCDS library includes many data sets from NASA satellites and various conventional data base sources. This system is located at the Goddard Space Flight Center in Greenbelt, Maryland.

NCSS--National Cooperative Soil Survey

The NCSS is a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agriculture Experiment Stations. In

some surveys, other Federal and local agencies also contribute. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the NCSS.

NDCDB--National Digital Cartographic Data Base

The NDCDB is a collection of the digital cartographic/geographic data files produced by the U.S. Geological Survey (USGS) as part of the National Mapping Division (NMD). The NDCDB contains elevation data, planemetric data, and landuse and landcover data in various map scales. The digital data are useful for the production of cartographic products such as plotting base maps and for various kinds of spatial analysis. A major use of these digital cartographic/geographic data is to combine them with other geographically referenced data, enabling scientists to conduct automated analyses in support of various decision making processes.

NDVI--Normalized Difference Vegetation Index

The NDVI is computed by calculating the ratio of the VI (vegetation index, i.e., the difference between Channel 2 and 1) and the sum of Channels 2 and 1. Thus NDVI = (channel 2 - channel 1) / (channel 2 + channel 1).

NEATLINES

Neatlines separate the body of a map from the map margin. On quadrangle maps, the neatlines are often the meridians and parallels that delimit the quadrangle.

NESDIS--National Environmental Satellite, Data and Information Service

NESDIS is the element in NOAA that is responsible for establishing a digital archive of data collected from the current generation of NOAA operational polar orbiting satellites.

NGDC--National Geophysical Data Center

The NGDC at Boulder, Colorado, was created in 1965. It is one of three data and information centers of NOAA's National Environmental Satellite, Data and Information Service (NESDIS). NGDC brings together in one data center activities in solar-terrestrial physics, marine geology/geophysics, and solid earth geophysics.

NIMA--National Imagery Mapping Agency

Activities formerly part of Combat Support Center (see DMA).

NIMBUS

The Nimbus satellite program, initiated by the National Aeronautics and Space Administration (NASA) and later operated by both NASA and the National and Oceanic Atmospheric Administration (NOAA), was developed in the early 1960s to meet research and development needs of the atmospheric and Earth scientists, providing global surveillance of the atmospheric structure at low Earth orbital altitudes for the world's weather services.

NN--Nearest Neighbor Resampling

When correcting image data points, the nearest neighbor technique assigns for each new pixel that pixel value which is closest in relative location to the newly computed pixel location.

NOAA--National Oceanic and Atmospheric Administration

The NOAA, under the Department of Commerce, operates the civil polar-orbiting and geo-stationary satellite systems for the collection of atmospheric and environmental data.

NPS--National Park Service, Department of the Interior

In 1916, Congress enacted the establishment of the NPS to provide unified administration of parks and monuments. The NPS manages a diverse system of entities including parks, monuments, historic sites, battlefields, seashores, lakeshores, and recreation areas. The NPS also directs programs to assist other Federal agencies, State and local governments, and individuals in the protection of architectural, archeological, historical, and natural resources that are not part of the National Park System.

NRCS--Natural Resources Conservation Service

The U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) provides leadership and administers programs to help people conserve, improve, and sustain natural resources and the environment. NRCS' work covers three major areas: soil and water conservation, natural resource surveys, and community resource protection and management. Prior to 1995, NRCS was known as the SCS (Soil Conservation Service).

NSDI--National Spatial Data Infrastructure

Executive Order 12906, "Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure," was signed on April 11, 1994, by President William Clinton. Under this order, each Federal agency is to document all new geospatial data it collects or produces, either directly or indirectly, using the standard developed by the Federal Geographic Data Committee (FGDC) and make that documentation electronically accessible to the Clearinghouse network.

OBLIQUE

An image taken with a camera or sensor with the axis intentionally directed between the vertical and horizontal planes. A high oblique image includes the horizon in the field of view, while a low oblique shows only the Earth's surface.

ONC--Operational Navigation Chart

The ONC series covers most of the world landmass areas at 1:1,000,000 scale. At this scale it takes 62 charts to cover the conterminous United States. Information on these charts includes cities and landmarks, drainage, and relief (shown by shading and contours). International and State boundaries are shown, but not county boundaries.

ORACLE

Headquartered in Redwood Shores, California, Oracle provides relational database products, development tools, and client/server applications.

ORNL--Oak Ridge National Laboratory

ORNL, under the Department of Energy's Environmental Science Division and host to the Carbon Dioxide Information Analysis Center, is located in Oak Ridge, Tennessee. Approximately 15,000 research scientists are working on projects sponsored by the Department of Energy, Environmental Protection Agency, Federal Regulatory Commission, and other Government offices. Research activities focus on the variety of unique aspects relating to global change and energy concerns.

ORTHO-CORRECTION

Correction applied to satellite imagery to account for terrain-induced distortion.

OVERSHOOT

That portion of an arc (line) digitized past its intersection with another arc. See dangling arc.

PARSE

To break down a sequence of letters or numbers into meaningful parts based on their location in the character sequence. For example, the first three numbers in the GLIS access phone number 6055946888 are the area code numbers that identify the phone number as a South Dakota location.

PC WORK STATION

As defined by GLIS, a PC work station is a 80286 or greater AT micro computer running the MS-DOS operating system version 3.0 or higher. The PC should have 640 kilobytes of computer memory and have a VGA 16 color 4 bit graphics board and color monitor. To allow connection with the GLIS server the PC work station should have a Hayes or Hayes compatible modem and some type of PC communication package. The PC should also have at least 1 megabyte of hard disk space for GLIS software and data files.

Optional GLIS PC work station requirements include a mouse, math co-processor, and dot matrix or laser printer.

PERMAFROST

A permanently frozen layer at variable depth below the surface in frigid regions of a planet (as Earth).

PHENOLOGY or PHENOLOGICAL

Refers to the rate and timing of natural events, such as the growth cycle of vegetation over a growing. Land cover and vegetation types may often be distinguished from each other by their characteristic spectral/temporal signature, as illustrated by a graph plotting NDVI values against time through a growing season for several agricultural categories. The shape and position of each curve defines that category's phenological characteristics.

PHYSIOGNOMIC

The aspect and character of an abstract entity.

PIXEL

An abbreviation of picture element. The minimum size area on the ground detectable by a remote sensing device. The size varies depending on the type of sensor.

PLANCK'S CONSTANT

Early in the twentieth century, Max Planck recognized the discrete nature of radiant energy exchanges and proposed the quantum theory of electromagnetic radiation. His experiments showed that energy is transferred in short wave trains or bursts in which each burst carries radiant energy, Q, proportional to the frequency, of the wave, so that: Q = hv where h = the universal, or Planck's constant, with a value of 6.625 X 10 to the -34 joule second. (a joule, in physics, is a unit of work equal to 10 million ergs.)

PLANIMETRIC

Two dimensional. The measurement of plane surfaces. A map representing only horizontal features. Parts of a map that represent everything except relief.

PLDS--Pilot Land Data System

The PLDS is a data and information management system developed to support land science research activities by archiving, retrieving, and transferring land data. The PLDS program, sponsored by the Communication and Information Systems Office, Land Processes Branch within the Office of Space Science and Applications of NASA, is managed by Goddard Space Flight Center with active participants at Ames Research Center (ARC) and the Jet Propulsion Laboratory (JPL).

PLSS--PUBLIC LAND SURVEY SYSTEM

The U.S. Public Land Survey System is the most widespread land ownership system in the United States. Roads, fields and political boundaries all reflect the character of a square grid system or more commonly the Township and Range System.

POES--Polar Orbiting Environmental Satellite

The POES system began in 1960 with the launch of TIROS-1. Later satellites in the Improved TIROS Operational Satellite (ITOS) program were expanded to capture concurrent multiple-channel data on a daily basis. Currently the Advanced TIROS-N satellites (renamed NOAA-6, 7, 8,

etc., after launch) offer 4 or 5 channel multispectral daily repetitive global coverage.

PRECISION

Precision is a statistical measurement of repeatability that is usually expressed as a variance or standard deviation, root mean square or RMS, of repeated measurements. These are expressed as x,y coordinates of arcs, label points, and tics in either single or double precision in ARC/INFO.

Single-precision coordinates have up to seven significant digits of precision. This allows for a level of accuracy of approximately 10 meters for a region whose extent is 1,000,000 meters across.

Double-precision coordinates have up to 15 significant digits; this allows for the precision necessary to represent any desired map accuracy at a global scale.

PROFILE

One method of making Digital Elevation Models (DEMs) is commonly referred to as profiling. In this technique a stereo pair of photographs is set up in a photogrammetric instrument and referenced to the ground using ground control points. After this process is completed the instrument automatically moves a computer cursor across the stereo model. As the cursor is being driven across the model, the operator controls the motion of the cursor while a recording device captures the elevation figures. Each swath across the stereo model is called a profile.

PROJECTION

Orderly system of lines on a plane representing a corresponding system of imaginary lines on an adopted terrestrial or celestial datum surface. Also, the mathematical concept of such a system. For maps of the Earth, a projection consists of (1) a graticule of lines representing parallels of latitude and meridians of longitude or (2) a grid.

QUANTIZE

To limit the possible values of (e.g., quantity) to a discrete set of values by quantum mechanical rules (Webster's II, 1994).

RADAR ALTIMETER

Instrument for measuring altitudes or elevations with respect to a reference level, usually mean sea level. A radar altimeter determines the height of an aircraft above the terrain by measuring the time required for an electromagnetic pulse to travel from aircraft to the ground and back again.

RADIAN

A radian is a unit of angular measure equal to the angle subtended at the center of a circle by an arc of length equal to the radius of the circle equal to approximately 57 degrees, 17 minutes, 44.6 seconds.

RADIANCE

Measure of the energy radiated by an object. In general, radiance is a function of viewing angle and spectral wavelength and is expressed as energy per solid angle.

RADIOMETRIC

A radiometer is a device used for detecting and measuring radiation. These measurements of electromagnetic radiation are referred to as radiometric measurements.

RAMP/AUTO CALIBRATION

Diagnostic measurements pertaining to the linear electrical performance of the sensor.

RASTER

A raster image is a matrix of row and column data points whose values represent energy being reflected or emitted from the object being viewed. These values, or pixels, can be viewed on a display monitor as a black and white or color image.

RASTERIZE

The process of converting vector points, lines, and areas into raster image format.

RBV--Return Beam Vidicon

The RBV system on Landsats 1 and 2 consisted of three television-like cameras aimed to view the same 185 km-by-185 km area as the multispectral scanner (MSS) sensor. The RBV system did not contain film. The images were exposed by a shutter device and stored on a photosensitive surface within each camera. This surface is then scanned in raster form by an internal electron beam to produce a video signal.

The RBV system instantaneously imaged an entire scene, had greater inherent cartographic fidelity than imagery acquired by the Landsat MSS sensor, and contained a reseau grid in the image to facilitate geometric correction of the imagery. This resulted in an array of tick marks that were precisely placed in each image.

The RBV system on Landsat 1 produced only 1690 scenes between July 23 and August 5, 1972, when a tape recording switching problem forced a system shutdown. The RBV system on Landsat 2 was operated primarily for engineering evaluation purposes and only occasional RBV imagery was obtained, primarily for cartographic uses in remote areas.

These images are no longer available.

REFLECTANCE

Reflectance is the fraction of the total radiant flux incident upon a surface that is reflected and that varies according to the wavelength distribution of the incident radiation.

RELATIONAL DATABASE

A way of modeling information in a database by relations between the features. Relations are usually represented as a collection of tables where each table contains the occurrences of a particular feature. Each column of the table corresponds to an attribute and each row is an instance of the feature. For example, two related tables might be created to describe types of transportation networks in a data set. The first table has columns that uniquely identify the transportation feature, and another that contains codes that describe the transportation type (trails, roads, railways, ferries, etc.). A second table, which relates to the first, might contain columns that list the transportation codes used in the first (related) table, and a second column that defines, in further detail, the definition of the code (gravel, asphalt, concrete, etc) and road maintenance schedule for that type of road surface. The benefit of a relational database is that repetitive information is not recorded numerous times in a table, but instead is

pointed to in related tables. Also referred to as Relational Database Management Systems (RDBMS).

REMOTE LINK

A remote link is a direct connection to a computer-based system located at another data center. Links are established via wide area networks and are initiated by the GLIS software. Once connection is established, the control of the user's session is passed to that system.

RESEAU GRID

An array of tick marks precisely placed in an image.

RESIDUAL ANOMALY

Residual anomalies are geophysically defined features that represent the difference between total (actual) and regional (modeled) geophysical fields; i.e. residual field or anomaly.

RMSE--Root Mean Square Error

The RMSE statistic is used to describe accuracy encompassing both random and systematic errors.

The square of the difference between a true test point and an interpolated test point divided by the total number of test points in the arithmetic mean. The square root of this value is the root mean square error.

SAST--Scientific Assessment and Strategy Team

SAST is an interdisciplinary team of senior scientists and engineers from various Federal Government agencies assigned to assess and report on the damage caused by the flood of 1993 and to provide assistance and advice to Federal officials responsible for making decisions with respect to the flood recovery in the Upper Mississippi and Missouri River basin.

SCS--Soil Conservation Service

The U.S. Department of Agriculture's Soil Conservation Service changed its name in 1995 to (NRCS).

SDTS--Spatial Data Transfer Standard

The SDTS was approved in July 1992 as Federal Information Processing Standard (FIPS) 173. The Standard allows the exchange of digital spatial data between different computer systems. It provides a solution to the problem of spatial data transfer from the conceptual level to the details of physical file encoding. Transfer of spatial data involves modeling spatial data concepts, data structures, and logical physical file structures.

SEASONALLY DISTINCT LAND COVER REGIONS

The concept of seasonally distinct land cover regions is based on the unique phenological characteristics of different agricultural crops or natural vegetation, such as the time of spring green-up, magnitude of maximum NDVI (greenness), time of leaf senescence, and seasonal duration of green periods. These regions, based on both spectral and temporal characteristics, can be expected to possess relatively homogenous vegetation types and associations, land use, or mosaics and mixtures of land cover types.

SHADED RELIEF

Shading added to an image that makes the image appear to have three dimensional aspects. This type of enhancement is commonly done to satellite images and thematic maps utilizing digital topographic data to provide the appearance of terrain relief within the image.

SINKS

Interrupted drainage develops on limestone or dolomite beds through the dissolving action of water on the formation. Consequently, streams can disappear into subterranean caverns, often not re-emerging until they have traveled underground for a considerable distance. The term sink (or sinkhole) or karst drainage is sometimes used to describe this unusual stream pattern.

SOIL CLASSIFICATION

The systematic arrangement of soils into groups or categories based on their characteristics. Broad groupings are made on the basis of general characteristics and subdivisions on the premise of more detailed differences in specific properties.

SOIL PHASE

A subdivision of a soil classification, usually a soil series or other unit based on characteristics that affect the use and management of the soil but which do not vary sufficiently to differentiate it as a separate soil series.

SOIL SLOPE

The degree of deviation of a surface from horizontal that is measured as a percentage, a numerical ratio, or in degrees.

SOIL TEXTURE

The relative proportions of sand, silt, and clay separates in a soil as described by the classes of soil texture.

SPACE IMAGING

The U.S. Government transferred commercial sales rights of the Landsat program to the private sector from September 27, 1985 through July 1, 2001, authorizing a contract with Space Imaging. The Landsat program involves satellite remote sensing of the Earth's resources and the dissemination of that data to users worldwide.

Space Imaging is a joint venture/partnership formed by Hughes Aircraft Company and RCA Corporation.

As of July 1, 2001 the commercial sales rights of the Landsat program were transferred back to the U.S. Government. All landsat products are now available from the USGS.

SPECTRAL GAMMA

This is a technique of examining individual wavelengths of gamma radiation of rocks in a drill hole.

SPHEROID

Mathematical figure closely approaching the geoid in form and size and used as a surface of reference for geodetic surveys. A reference spheroid or ellipsoid is a spheroid determined by revolving an ellipse about its shorter (polar) axis and used as a base for geodetic surveys of a large section of the Earth (such as the Clarke spheroid of 1866 which is used for geodetic surveys in the United States).

SSURGO--Soil Survey Geographic

The SSURGO data base provides the most detailed level of soils information and was designed primarily for farm and ranch, landowner/user, township, county, or parish natural resource planning and management.

STABLE BASE

In cartography, a stable base includes those source materials with a better likelihood for dimensional stability and longevity than paper (e.g., Mylar or film).

STATSGO--State Soil Geographic

The STATSGO is a State soil geographic data base designed primarily for regional, multi-State, river basin, State, and multi-county resource planning, management, and monitoring. These data are not detailed enough to make interpretations at a county level.

STEREO

Involves binocular vision techniques which enables the observer to view imagery simultaneously from two different perspectives to achieve the mental impression of a three-dimensional image.

SWATH

A swath of data is all data received from a spacecraft on a single pass from acquisition of signal (AOS) to loss of signal (LOS).

TAPE BLOCK

An aggregate or group of characters, words, records, or information considered as a single unit and recorded on magnetic tape to adjacent physical locations. Blocking is done for convenience of data handling and particularly for ease in error recovery.

TAR--Tape ARchive

The UNIX tar command archives (saves) and extracts (restores) multiple files onto a single tarfile archive. A tarfile is usually a magnetic tape, but it can be any file. This single logical file may span multiple physical tapes. This is known as multi-volume tar. Such tapes do not have a filemark at the end of intermediate volumes, and an archived file may be split across

multiple tapes. The tar programs for Macintosh and DOS environments are available at the following websites.

TBM--TeraBit Memory

TBM header record. The TBM Header contains data type and selection parameters. A terabit is equal to one trillion bits.

TCP--Tie Control Point

TCPs are points that have been registered and/or rectified on an image or a planimetric surface with respect to some horizontal coordinate system and/or vertical datum.

TDRS and TDRSS--Tracking and Data Relay Satellite System

A system of geosynchronous communication satellites launched for the purpose of receiving and relaying data, commands, and telemetry signals to and from all NASA orbiting satellites and space shuttles. The TDRS system will reduce the number of ground stations needed to handle satellite communications and will simplify the handling of a growing volume of satellite telecommunications traffic.

TERRESTRIAL BIOMASS

Total mass of living matter that lives or grows on land.

THEMATIC DATA

Thematic data layers in a data set are layers of information that deal with a particular theme. These layers are typically related information that logically go together. Examples of thematic data would include a data layer whose contents are roads, railways, and river navigation routes.

THEME

A single thematic data layer in GIS.

THERMAL INFRARED

Phrase used to describe the middle wavelength ranges in the infrared portion of the electromagnetic spectrum. Ranging between 3 microns and 20 microns, most remote sensing applications utilize the 8- to 13-micron range. This is emitted energy whereas other infrared (near infrared) is reflected energy.

THIN-SECTION

This is a visual examination of a thin slice of rock or mineral which is examined under a microscope in plain or polarized light to identify the minerals and their composition and texture.

TIGRIS--Topologically Integrated Geographic and Resource Information System

The TIGRIS is a geographic information system developed by Intergraph Corporation that is used to capture and analyze map features (nodes, lines, and areas).

TIROS-N--Television and Infrared Observation Satellite, N Series

The TIROS-N is the latest family of satellites originally began in 1960 in the Polar Orbiting Environmental Satellite program. Renamed NOAA-6, -7, -8, etc., after launch, these Satellites offer 4 or 5 channel multispectral daily repetitive global coverage.

TM--Thematic Mapper

The TM is a nonphotographic imaging system which utilizes an oscillating mirror and seven arrays of detectors which sense electromagnetic radiation in seven different bands. The thematic mapper sensor is a derivative of the multispectral scanner (MSS) generation of scanners, achieving greater ground resolution, spectral separation, geometric fidelity, and radiometric accuracy.

TMA

The term TMA initially referred to Trimetrogon Aerial photography. In recent years, however, SCAR missions have been flown using several different camera systems. Since the term TMA was so well understood by the SCAR community, it was decided to keep TMA as part of the photographic identification.

TOPOGRAPHIC MAP

Map that presents the horizontal and vertical positions of the features represented; distinguished from a planimetric map by the addition of relief in measurable form.

TOPOGRAPHY

Configuration (relief) of the land surface; the graphic delineation or portrayal of that configuration in map form, as by contour lines; in oceanography the term is applied to a surface such as the sea bottom or a surface of given characteristics within the water mass.

TOPOLOGICALLY STRUCTURED

Refers to the point, line, or area features of a data set and the relationships between these features. These relationships are expressed as connections between spatially touching lines, small areas contained within larger areas, lines that make up the sides of an area or polygon, etc. Topology does not provide information as to the features' meanings, only their identity and structural relationships as they define spatial objects.

TOPONYMIC

A name that is derived from a place or a region.

TOWNSHIPS

Townships are geographical rather than political divisions defined by a parcel of land bounded on the east side and the west side by meridians six miles apart at its south border and has a north to south extent of six miles. Townships are an element of the United States and Canadian public-land survey systems.

UNDERSHOOT

An arc that does not intersect another arc. See dangling arc.

USGS--United States Geological Survey

Established in March of 1879, the Geological Survey's primary responsibilities are: investigating and assessing the Nation's land, water, energy, and mineral resources; conducting research on global change; investigating natural hazards such as earthquakes, volcanos, landslides, floods, and droughts; and conducting the National Mapping Program. To attain these objectives, the Geological Survey prepares maps and digital and cartographic data; collects and interprets data on energy and mineral resources; conducts nationwide assessments of the quality, quantity, and use of the Nation's water resource; performs fundamental and applied research in the sciences and techniques involved; and publishes and

disseminates the results of its investigations in thousands of new maps and reports each year.

UTM--Universal Transverse Mercator Projection

UTM is a widely used map projection that employs a series of identical projections around the world in the mid-latitude areas, each spanning six degrees of longitude and oriented to a meridian. This projection is characterized by its conformality; that is, it preserves angular relationships and scale plus it easily allows a rectangular grid to be superimposed on it. Many worldwide topographic and planimetric maps at scales ranging between 1:24,000 and 1:250,000 use this projection.

VECTOR

Any quantity which has both magnitude and direction, as opposed to scaler which has only magnitude.

VECTOR DATA

Vector data, when used in the context of spatial or map information, refers to a format where all map data is stored as points, lines, and areas rather than as an image or continuous tone picture. These vector data have location and attribute information associated with them.

VERTICAL POSITIONAL ACCURACY

Vertical positional accuracy is based upon the use of USGS source quadrangles which are compiled to meet National Map Accuracy Standards (NMAS). NMAS vertical accuracy requires that at least 90 percent of well defined points tested be within one half contour interval of the correct value. Comparison to the graphic source is used as control to assess digital positional accuracy.

VERTICES

Vertices are the intersecting points of lines. Commonly, in GLIS data sets, these points define either unique locations which represent end points of a line feature, or corners of a polygon or area feature.

WGS 72--World Geodetic System 1972

The definition of DMA DEMs, as presently stored in the USGS data base, references the WGS 72 datum. WGS 72 is an Earth-centered datum. The WGS 72 datum was the result of an extensive effort extending over approximately three years to collect selected satellite, surface gravity, and

astrogeodetic data available throughout 1972. These data were combined using a unified WGS solution (a large-scale least squares adjustment).

WGS 84--World Geodetic System 1984

The WGS 84 datum was developed as a replacement for WGS 72 by the military mapping community as a result of new and more accurate instrumentation and a more comprehensive control network of ground stations. The newly developed satellite radar altimeter was used to deduce geoid heights from oceanic regions between 70 degrees north and south latitude. Geoid heights were also deduced from ground-based Doppler and ground-based laser satellite-tracking data, as well as surface gravity data. This system is described in "World Geodetic System 1984," DOD DMA TR 8350.2 September 1987. New and more extensive data sets and improved software were used in the development.

WRS--Worldwide Reference System

The WRS is a global indexing scheme designed for the Landsat program based on nominal scene centers defined by path and row coordinates.

X-RAY FLUORESCENCE SPECTROSCOPY

This non-destructive analytical technique is used to determine concentrations of specific chemical elements. The procedure is based on the artificially induced absorption, atomic excitation, and emission of electromagnetic radiation at characteristic wavelengths.

ZENITH

Zenith is the point on the celestial sphere vertically above a given position or observer.